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OBJECTIVES

1. Code development and delivery

2. Validation and QA prototyping activities.

TASK PROGRESS

1. Code development/ deliveries

The Science Computing Facility (SCF) was dismantled and moved to another location (March, 1998). The SCF has now been connected to a 100 BaseT VBNS line. We are currently working on further integration of system hardware and software. This transition was particularly difficult in that our half-time Systems Administrator/ half-time Programmer quit in February, following attendance at the MODland-SDST meeting. We have recently hired a replacement and also we brought in a student with experience in coding algorithms and sent him to NASA-GSFC for 4 weeks to help meet delivery schedules.

This person, Kamel Didan was previously working on the ADEOS-2 GLI project and had started working on compositing of SeaWiFS data. In March he was transferred to MODIS coding and went to GSFC to work on the MOD_PR13A1 and A2 for delivery. His accomplishments during this period include:

- correct the code for memory problems reported by SDST
- optimize the code to satisfy time allotments
- learned to use the SDP toolkit and HDF-EOS
- prepare for CMG code implementation
- start learning QA tools developed by LDOPE

Both PR13A1 and PR13A2 are now baselined and being tested by SDST.

Wim van Leeuwen and Brad Castalia attended the MODLAND meeting (MODLAND/SDST meeting, Feb. 11-13, 1998) where validation and QA plans

were presented and discussed. A vegetation index product 'Quality Assurance (QA)' plan that took into account accuracy assessments and validation activities was drafted and presented at the MODLAND meeting. Also presented were the results of 16 days of compositing orbital 1 km AVHRR data for the North American continent with the MODIS and MVC algorithms.

2. Validation activities

Test Sites and Validation Protocols

For validation work we have been organizing the global sites which are to be used for making measurements and/or monitoring. Secondly, we are also developing vegetation sampling and measurement protocols so that a consistent set of data can be accumulated over a wide range of conditions. The validation sites are organized by priority based on landcover class. These sites are summarized in a spreadsheet with categories for latitude/longitude, Landsat and SPOT scene ID's, Path/Row, and coordinates. There are also general biome descriptions and a first cut attempt at assessing what instrumentation, and what possible dates exist for site visits. Two sites for each landcover class are considered the minimum number required for producing a regression of the biophysical and radiometric measurements; hence, a critical list of 12-16 sites (due to duplicate sites) resulted, another 12 sites are desirable for measurement collection, and 24 more sites for monitoring purposes alone.

MODIS Quick Airborne Looks:

We are putting together a radiometric package for rapid and inexpensive validation of MODIS data over land. The proposed 'MODLAND Quick Airborne Looks' (MQUALS) is an airborne radiometric system (instrument and protocol) for product validation over global biome types. The light airborne package can be flown at low altitudes of 150m to 300m AGL so as to collect measurements with negligible or no atmosphere influences for accurate characterization of top-of-canopy reflectances. The basic package consists of well calibrated and traceable "transfer radiometers", digital spectral cameras, and an albedometer, all attached to a laptop computer for synchronized and timed measurements. Typical coverage would be in the range of ten kilometers or less at a 'pixel'

resolution between 1 and 2 meters. A key feature of MQUALS is the rapid turn-around of the airborne measured results to under a week.

The airborne package can be easily shipped and mounted on a variety of light airplanes. The package is equipped with simple instrumentation so that with minimal training any person can conduct a rapid deployment. The flying costs of a deployment with transect measurements at various sun angles from morning till noon would cost under $1K per day.

Uncertainty Analysis

Tomoaki Miura, Ph.D. student has been working on establishing an "end-to-end" uncertainty analysis approach for the MODIS Vegetation Index (VI) products. The established approaches have been utilized to evaluate the effects of radiometric calibration uncertainties on the VI uncertainties using field data. Currently, the results of the analyses are being summarized for a publication and being tested with TM imagery. In addition, Tomoaki has been accepted by the 1998 USRA-NASA/GSFC, Graduate Student Summer Program (GSSP), and will be evaluating aerosol effects as part of his "end-to-end" accuracy assessment of the MODIS VI compositing procedure, which includes calibration, atmosphere, and sun-target-sensor geometries. He is teamed with Dr. Brent Holben and will be looking at the array of sun photometer sites. He has also submitted a proposal to the 1998 NASA Earth System Science Fellowship Program.

Canopy Simulation Models

Xiang Gao, Ph.D. student is working with the Myneni 3-dimensional Canopy Radiative Transfer Model, "Disord". As a part of validation, this work is aimed at testing the MODIS VI algorithm by examining the relationship between Vegetation Indices (NDVI, SAVI, EVI) and canopy biophysical parameters (LAI, fAPAR) over a diverse range of six Biome types (cereal crops & grasses, shrub, broadleaf crops, savanna, broadleaf forest and needle forest). The effects of several sets of parameters (illumination geometry, soil background, ground cover, understory Leaf Area Index, etc.) on the canopy BRF are performed by varying one variable at a time and setting the remaining variables at nominal values which are believed to represent an average state of each biome. Some preliminary results about the differences in the relationship of LAI/fAPAR to VIs

among those biomes have been obtained but need further analysis. One important test being made is to determine if there is justification for multiple vegetation indices.

Other activities:

Wim van Leeuwen and several students attended the Remote Sensing Network Meeting (Tucson, April 15, 1998) to discuss remote sensing data requirements for the application user community.

Two papers were submitted for IGARSS'98 proceedings:

1. W.J.D. van Leeuwen, Alfredo Huete, Trevor Laing, "Evaluation of the MODIS vegetation index compositing algorithm using SeaWiFS data" and,

2. A.R. Huete, Dana Kerola, Kamel Didan, Wim J.D. van Leeuwen, Laerte Ferreira, "Terrestrial Biosphere Analysis of SeaWiFS data over the Amazon Region with MODIS and GLI Prototype Vegetation Indices".

Next Quarter Activities

Maricopa validation test site:

As part of the preparation for the Maricopa community validation site, a series of Airborne Terrestrial Applications Sensor (ATLAS) overflights and field experiments will take place at Maricopa Agriculture Center. Six overflights are currently scheduled beginning in early May and extending to September. Field experiments will include measurement of LAI (LiCOR-LAI2000) and f_{APAR} (using an accuPAR Ceptometer) measurements along with ground and airborne radiometry. ATLAS will acquire 2.5m data in 6 channels in the VIS/NIR and six additional channels in the thermal. Because of the delay in the EOS-AM1 launch, the scheduled AVIRIS overflight at Maricopa wa postponed until the peak of the winter growing season in February-March 1999.

LBA-Ecology activities:

The second Science team meeting for LBA-Ecology will be held at the end of April 1998. This is an implementation meeting and both myself and Yosio Shimabokuro will attend and discuss joint MODland - Brazil cooperation.

MQUALS proposal:

The MQUAL package for quick airborne radiometry is ready to be submitted to MODland for evaluation by the group.